APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | Date: | 1-24-01 |
| Project: | Test Stand 2A | Rev: | 2 |
| | | By: | HJW/DJV |

**TAG NO.** **ROV-0053** Drawing No. P&ID 1

Description: GN2 Pressurant Line to LOX Run Tank Main ROV by-pass

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | 300A |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 1/2" | Body Rating (PSIG) | 10,000 |
| Face-to-Face Dimension (IN): | **10-5/8"** | Inlet Pipe Spec.: | S10K-A |
| End Connections: | Reflange **F.50XXG04ESA2** | Outlet Pipe Spec: | S10K-C |
| Body Material: | 304 SS | Trim Material: | By Manufacturer |
| Seal Leak Class: | V | Bonnet Type: | Regular |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | P | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 150 (GN2) |
| Open Stroke Time (MSEC): | 1000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | CLOSE | Sizing Dp (PSI): | 10,000 |
| Spring (Y/N): Y | Mode:Close | Failure Mode (Electrical): | Close (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | GN2 | Molecular Weight: | 28.008 |
| Min./Max. Temp. (°F): | -50 to 200 °F | Critical Pressure (PSIA): | 492.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow: | 2.40 lbm/sec | Density: | 29.62 $lbm/ft^3$ |
| Inlet Pressure (PSIA): | 9500 | Outlet Pressure (PSIA): | 100 (Initial--will increase to 9500) |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim: | LINEAR | Selected 100% Travel Cv: | .5 |
| Keep Cv Within: | +5% to -10% | Desired Minimum Cv Turndown: | NA |

(1) Note: Solenoid valves shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position.

(2) Note: Valve shall meet special material and testing requirements for LOX softgoods.

(3) Note: valve must be able to open under full design DP (10,000psi) and valve must fail in designated position under full design DP

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | | Date: 01-24-01 |
| Project: | Test Stand 2A | | Rev: 1 |
| | | | By: HJW/DJV |
| **TAG NO.** | **ROV-2814** | Drawing No. | P&ID 2 |
| Description: | Large LOX Run Line High Point Bleed Valve | | |

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 1" | Body Rating (PSIG) | 8500 |
| Face-to-Face Dimension (IN): | 11.25 | Inlet Pipe Spec.: | **S8.5K-C** |
| End Connections: | Reflange F01XXG05EC4 | Outlet Pipe Spec: | **S8.5K-C** |
| Body Material: | Monel 400 | Trim Material: | By Manufacturer |
| Seal Leak Class: | VI | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | P | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 150 (GN2) |
| Open Stroke Time (MSEC): | 1000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | CLOSE | Sizing Dp (PSI): | 8500 |
| Spring (Y/N): Y | Mode: CLOSE | Failure Mode (Electrical): | CLOSE (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | LOX | Molecular Weight: | 32.00 |
| Min./Max. Temp. (°F): | -320 to 200 | Critical Pressure (PSIA): | 736.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow | Not Critical | Density: | 75.10 lbm/ft$^3$ |
| Inlet Pressure (PSIA): | 6500 | Outlet Pressure (PSIA): | 230 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim:: | Linear | Selected 100% Travel Cv: | 6 to 10 |
| Keep Cv Within: | Not Critical | Desired Minimum Cv Turndown: | 30:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve shall meet special material and testing requirements for LOX softgoods

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | |
|---|---|---|
| Customer: | United States Air Force Research Laboratory | Date: 01-24-01 |
| Project: | Test Stand 2A IPD Redesign | Rev: 2 |
| | | By: HJW/DJV |
| **TAG NO.** | **ROV-2816** | Drawing No. P&ID 1 |
| Description. | LOX Run Tank Fill ROV | |

## ♦♦♦♦GENERAL♦♦♦♦

| | |
|---|---|
| Manufacturer: | Model and Type: **GLOBE** |
| Balanced Valve | MIL-STD-1246C Cleanliness Level: **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 3" | Body Rating (PSIG) | 8500 |
| Face-to-Face Dimension (IN): | 21.5 | Inlet Pipe Spec.: | M8.5K-C |
| End Connections: Reflange | **FO3-.769G20EC4** | Outlet Pipe Spec: | M8.5K-C |
| Body Material: | Monel 400 | Trim Material: | By Manufacturer |
| Seal Leak Class: | VI | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | P | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 150 |
| Open Stroke Time (MSEC): | 2000 | Close Stroke Time (MSEC): | 2000 |
| Flow Action to (OPEN/CLOSE): | OPEN | Sizing Dp (PSI): | 100(4) |
| Spring (Y/N): Y | Mode: CLOSE | Failure Mode (Electrical): | CLOSE (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | LOX | Molecular Weight: | 32.00 |
| Min./Max. Temp. (°F): | -320 to 200° | Critical Pressure (PSIA): | 736.50 |

| CONDITION | | | |
|---|---|---|---|
| Flow: | Not Critical | Density: | 74 lbm/ft$^3$ |
| Inlet Pressure (PSIA): | 25 | Outlet Pressure (PSIA): | 20 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim: | Linear | Selected 100% Travel Cv: | 81 |
| Keep Cv Within: | Not Critical | Desired Minimum Cv Turndown: | 30.1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve shall meet special material and testing requirements for LOX softgoods

(3) Note: This valve is normally closed and will be subjected to low pressure and flow rates when open. When closed it will be subjected to a maximum differential pressure across the plug of 8500 psig.

(4) Note: Actuator shall not be capable of opening valve when pressure on outlet (tank) side of valve is >=1000psi

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | | Date: 01-24-01 |
| Project: | Test Stand 2A IPD Redesign | | Rev: 1 |
| | | | By: HJW/DJV |
| **TAG NO.** | **ROV-2817** | Drawing No. | P&ID 1 |
| Description: | LOX overboard dump ROV and Emergency Vent | | |

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | 300A |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 3" | Body Rating (PSIG) | 8500 |
| Face-to-Face Dimension (IN): | 16.5" | Inlet Pipe Spec.: | M8.5K-C |
| End Connections: | Buttweld (3) | Outlet Pipe Spec: | M8.5K-C |
| Body Material: | Monel 400 | Trim Material: | By Manufacturer |
| Seal Leak Class: | VI | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | P | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 1500 (GN2) |
| Open Stroke Time (MSEC): | 1000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | CLOSE | Sizing Dp (PSI): | 8500 |
| Spring (Y/N): Y | Mode: CLOSE (2) | Failure Mode (Electrical): | CLOSE (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid | LOX | Molecular Weight: | 32.00 |
| Min./Max. Temp. (°F): | -320 to 200° | Critical Pressure (PSIA): | 736.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow: | Not Critical | Density: | 75.10 lbm/ft$^3$ |
| Inlet Pressure (PSIA): | 6500 | Outlet Pressure (PSIA): | 230 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim: | Linear | Selected 100% Travel Cv: | 110 |
| Keep Cv Within: | Not Critical | Desired Minimum Cv Turndown: | 30:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve shall meet special material and testing requirements for LOX softgoods

(3) Note Buttweld ends of valve shall match customers pipe wall thickness of .769" and 3.500" pipe OD. Buttweld shall be prepared in accordance with ANSI B31.3 Fig. 328.4.2(a) (use the straight bevel--not the "J" bevel).

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | |
|---|---|---|
| Customer: | United States Air Force Research Laboratory | Date: 2-5-01 |
| Project: | Test Stand 2A | Rev: 0 |
| | | By: HJW/DJV |
| **TAG NO.** | **ROV-0022** | Drawing No. P&ID 23 |
| Description: | PN 2002 Activation Valve | |

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 3" | Body Rating (PSIG) | 3000 |
| Face-to-Face Dimension (IN): | **18.12** | Inlet Pipe Spec.: | S1500-A |
| End Connections: Reflange | **F0308G-27** | Outlet Pipe Spec: | S1500-A |
| Body Material: | 304SS | Trim Material: | By Manufacturer |
| Seal Leak Class: | V | Bonnet Type: | Regular |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | P | Manufacturer: | |
| Servo (GPM): | | Model. | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 150 |
| Open Stroke Time (MSEC): | 1000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | OPEN | Sizing Dp (PSI): | 3000 |
| Spring (Y/N): Y | Mode: OPEN | Failure Mode (Electrical): | OPEN (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Y+Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | GN2 | Molecular Weight: | 28.0 |
| Min./Max. Temp. (°F): | -20 to 150° | Critical Pressure (PSIA): | 492.5 |

CONDITION

| | | | | |
|---|---|---|---|---|
| Flow: | 45 | lbm/sec | Density: 8.12 | $lbm/ft^3$ |
| Inlet Pressure (PSIA): | 1500 | | Outlet Pressure (PSIA): | 1400 |
| Viscosity: | | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | | Estimated SL (dBA): | |
| Required Trim: | Linear | | Selected 100% Travel Cv: | 100 |
| Keep Cv Within: | +10% to -10% | | Desired Minimum Cv Turndown: | NA |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | Date: | 01-24-01 |
| Project: | Test Stand 2A | Rev: | 2 |
| | | By: | HJW/DJV |
| **TAG NO.** | **XCV-0010** | Drawing No. | P&ID 1 |

Description: GN2 Pressurant Line to LOX Run Tank Small Pressure Control Valve

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 3" | Body Rating (PSIG) | **10,000** |
| Face-to-Face Dimension (IN): | **19-7/8"** | Inlet Pipe Spec.: | **S10K-C** |
| End Connections: | Reflange **F03.853G16ESC2** | Outlet Pipe Spec: | **S10K-C** |
| Body Material: | 304SS | Trim Material: | By Manufacturer |
| Seal Leak Class: | V | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | H | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | 17 | Actuation Pressure (PSIG): | 3000 |
| Open Stroke Time (MSEC): | 300 | Close Stroke Time (MSEC): | 300 |
| Flow Action to (OPEN/CLOSE): | OPEN | Sizing Dp (PSI): | 10.000 |
| Spring (Y/N): Y | Mode:OPEN | Failure Mode (Electrical): | OPEN (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Y+Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | GN2 | Molecular Weight: | 28.008 |
| Min./Max. Temp. (°F): | -320 to 200° | Critical Pressure (PSIA): | 492.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow: | 100 lbm/sec | Density: | 27.59 to 29.62 lbm/ft$^3$ |
| Inlet Pressure (PSIA): | 7500 to 9500 | Outlet Pressure (PSIA): | 6500 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv FI at Lift: | | Estimated SL (dBA): | |
| Required Trim: | Equal Percentage | Selected 100% Travel Cv: | **41** |
| Keep Cv Within: | +20% to -10% | Desired Minimum Cv Turndown: | 40:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve shall meet special material and testing requirements for LOX softgoods

(3) Note: Valve will be in close proximity to LOX and LOX may enter valve during certain filling operations

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | | Date: 01-24-01 |
| Project: | Test Stand 2A | | Rev: O |
| | | | By: HJW/DJV |
| **TAG NO.** | **XCV-0801** | Drawing No. | P&ID 47 |
| Description: | GN2 Vent Valve from V-333 | | |

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 2" | Body Rating (PSIG) | 10000 |
| Face-to-Face Dimension (IN): | 15.5" | Inlet Pipe Spec.: | S10K-A |
| End Connections: | Reflange F02-.579G14ES.A2 | Outlet Pipe Spec: | S10K-A |
| Body Material: | Carbon Steel | Trim Material: | By Manufacturer |
| Seal Leak Class: | V | Bonnet Type: | **Regular** |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | P | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 150 (GN2) |
| Open Stroke Time (MSEC): | 1000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | OPEN | Sizing Dp (PSI): | 10000 |
| Spring (Y/N): Y | Mode: OPEN | Failure Mode (Electrical): | OPEN (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Y–Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | GN2 with trace amounts of hydrocarbon | Molecular Weight: | 32.00 |
| Min./Max. Temp. (°F): | -50 to 200° | Critical Pressure (PSIA): | 736.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow: | | Density: | 20.79 to 23.41 lbm/ft$^3$ |
| Inlet Pressure (PSIA): | 5000 to 6000 | Outlet Pressure (PSIA): | 4500 to 5100 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim: | Linear | Selected 100% Travel Cv: | 24 |
| Keep Cv Within: | ± 10% | Desired Minimum Cv Turndown: | 30:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve must be capable of opening against full system DP

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | Date: | 01-24-01 |
| Project: | Test Stand 2A | Rev: | 2 |
| | | By: | HJW/DJV |
| **TAG NO.** | **XCV-2010** | Drawing No. | P&ID 1 |

Description: GN2 Pressurant line vent

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 2" | Body Rating (PSIG) | 8,500 |
| Face-to-Face Dimension (IN): | 15.5" | Inlet Pipe Spec.: | M8.5K-C |
| End Connections: Reflange | F02-.522G14EC4 | Outlet Pipe Spec: | M8.5K-C |
| Body Material: | Monel 400 | Trim Material: | By Manufacturer |
| Seal Leak Class: | V | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | H | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | 10 | Actuation Pressure (PSIG): | 3,000 |
| Open Stroke Time (MSEC): | 500 | Close Stroke Time (MSEC): | 500 |
| Flow Action to (OPEN/CLOSE): | OPEN | Sizing Dp (PSI): | 8,500 |
| Spring (Y/N): Y | Mode: OPEN | Failure Mode (Electrical): | OPEN (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Y=Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: GOX, GN2 | | Molecular Weight: | 28.008 |
| Min./Max. Temp. (°F): | -320 to 200° | Critical Pressure (PSIA): | 492.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow: | 94.2 lbm/sec | Density: | 19.57 to 25.62 $lbm/ft^3$ |
| Inlet Pressure (PSIA): | 4600 to 7000 | Outlet Pressure (PSIA): | 230 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim: | Equal Percentage | Selected 100% Travel Cv: | 33 vs 15 available |
| Keep Cv Within: | +20% to 10% | Desired Minimum Cv Turndown: | 30:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve shall meet special material and testing requirements for LOX softgoods

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | | Date: 01-24-01 |
| Project: | Test Stand 2A | | Rev: 1 |
| | | | By: HJW/DJV |
| TAG NO. | ROV-2812 | Drawing No. | P&ID 1 |
| Description | LOX Main Run Line Isolation Valve | | |

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | GLOBE |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | 300A |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 12"X 8" X 12" | Body Rating (PSIG) | 8500 |
| Face-to-Face Dimension (IN): | 63" | Inlet Pipe Spec.: | M8.5K-C |
| End Connections. Inlet--Buttweld (4). Outlet--Reflange XF12-3.081G67EC4 | | Outlet Pipe Spec: | M8.5K-C |
| Body Material. | Monel 400 | Trim Material: | By Manufacturer |
| Seal Leak Class: | VI | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | H | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | | Actuation Pressure (PSIG): | 3000 |
| Open Stroke Time (MSEC): | 3000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | CLOSE | Sizing Dp (PSI) | 8500 |
| Spring (Y/N): Y | Mode: CLOSE | Failure Mode (Electrical): | CLOSE(1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Open/Close Limit Switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: | LOX | Molecular Weight: | 32.00 |
| Min./Max. Temp. (°F): | -320° to 200° | Critical Pressure (PSIA): | 736.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow | 2000 lbm/sec | Density | 75.10 lbm/ft³ |
| Inlet Pressure (PSIA): | 6500 | Outlet Pressure (PSIA): | 6400 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Flat Lift | | Estimated SL (dBA): | |
| Required Trim: | Linear | Selected 100% Travel Cv: | 1312 |
| Keep Cv Within: | -10% to -10% | Desired Minimum Cv Turndown: | 30:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position.

(2) Valve shall be designed so it can be rotated up to 45° from the vertical about the axis through the inlet and outlet.

(3) Note: Valve shall meet special material and testing requirements for LOX softgoods.

(4) Note: Buttweld end of valve shall match customers pipe wall thickness of 3.081" and 12.75" pipe OD. Buttweld shall be prepared in accordance with ANSI B31.3 Fig. 328.4.2(b) (use the compound angle bevel--not the "J" bevel).

APPLIED ENGINEERING SERVICES

# ♦♦♦♦CONTROL AND REMOTE OPERATED VALVES♦♦♦♦

| | | | |
|---|---|---|---|
| Customer: | United States Air Force Research Laboratory | Date: | 01-24-01 |
| Project. | Test Stand 2A | Rev: | 1 |
| | | By: | HJW/DJV |

**TAG NO.** **XCV-0011** Drawing No. P&ID 1

Description: GN2 Pressurant to LOX Run Tank Large Pressure Control Valve

## ♦♦♦♦GENERAL♦♦♦♦

| | | | |
|---|---|---|---|
| Manufacturer: | | Model and Type: | **GLOBE** |
| Balanced Valve: | | MIL-STD-1246C Cleanliness Level: | **300A** |

## ♦♦♦♦BODY AND TRIM♦♦♦♦

| | | | |
|---|---|---|---|
| Nominal Body Size (IN): | 12" x 8" x 12" | Body Rating (PSIG) | 10,000 |
| Face-to-Face Dimension (IN): | 40" | Inlet Pipe Spec.: | S10K-C |
| End Connections: | Buttweld (3) | Outlet Pipe Spec: | S10K-C |
| Body Material: | 304SS | Trim Material: | By Manufacturer |
| Seal Leak Class: | V | Bonnet Type: | Extended |

## ♦♦♦♦ACTUATOR♦♦♦♦

| | | | |
|---|---|---|---|
| Hydraulic/Pneumatic (H/P): | H | Manufacturer: | |
| Servo (GPM): | | Model: | |
| Frequency Response (Hz): | 5 | Actuation Pressure (PSIG): | 3000 |
| Open Stroke Time (MSEC): | 1000 | Close Stroke Time (MSEC): | 1000 |
| Flow Action to (OPEN/CLOSE): | OPEN | Sizing Dp (PSI): | 10.000 |
| Spring (Y/N): Y | Mode:CLOSE | Failure Mode (Electrical): | CLOSE (1) |
| Positioner: | | Internal Filter/Moisture Separator (Y/N): | Y |
| Declutchable Manual Handwheel (Y/N): | N | Manual Hydraulic Mode Hand Pump: | N |
| Position Indicator: Y+open/close limit switches | | | |

## ♦♦♦♦FLUID DATA♦♦♦♦

| | | | |
|---|---|---|---|
| Fluid: GN2 | | Molecular Weight: | 28.008 |
| Min./Max. Temp. (°F): | -320 to 200° | Critical Pressure (PSIA): | 492.50 |

CONDITION

| | | | |
|---|---|---|---|
| Flow: | 920 lbm/sec (5) | Density: | 23.26 to 29.62 lbm/ft$^3$ |
| Inlet Pressure (PSIA): | 5800 to 9500 | Outlet Pressure (PSIA): | 4600 |
| Viscosity: | | Vapor Pressure: | |
| Required Cv Fl at Lift: | | Estimated SL (dBA): | |
| Required Trim: | Equal Percentage | Selected 100% Travel Cv: | 722 |
| Keep Cv Within: | -20% to -10% | Desired Minimum Cv Turndown: | 30:1 |

(1) Note: Solenoid valve(s) shall be provided on the valve manifolding to ensure the valve fails in the designated electrical failure mode position

(2) Note: Valve will be in close proximity to LOX and LOX may enter valve during certain filling operations

(3) Note: Buttweld ends of valve shall match customers pipewall thickness of 3.109" and 12.75" pipe OD. Buttweld shall be prepared in accordance with ANSI B31.3 Fig. 328.4.2(b) (use the compound angle bevel---not the "J" bevel)

(4) Note: Valve shall meet special material and testing requirements for LOX softgoods

(5) Note: 920 lbm/sec is worst case--other flows are 435 lbm/sec with 9500 psi to 7000 psi inlet pressure. 6800 psi outlet pressure